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LESSONS ON DAIRYING FOR RURAL SCHOOLS.[1]

By ALVIN DILLE, *Assistant in Agricultural Education.*[2]

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INTRODUCTION.

There are few branches of agriculture that take as little fertility from the soil and at the same time returns a profit to the farmer as dairy farming. While teaching dairy farming is not the purpose of this bulletin, yet it is the basis of the lessons presented. These lessons present the subject from the standpoint of clean milk production, milk products, milk as a food in the home and as a supplement to other food materials, and have been prepared to give to the organized school work in elementary agriculture additional impetus in dairying, to provide material for instruction that is within the range of elementary pupils, and to furnish a topic for home projects that may be worked out with profit to every community and with real educational value to the pupils concerned.

SOURCES OF INFORMATION.

Practically all the subject matter for class use and instructions for home projects will be found in bulletins available, either free or at a small cost. Almost every State agricultural college has published

[1] Prepared under the direction of F. E. Heald, Specialist in Agricultural Education, States Relations Service, U. S. Department of Agriculture, Washington, D. C.

[2] The writer is indebted to the Dairy Division of the Bureau of Animal Industry and to the Office of Home Economics for valuable assistance in preparing this bulletin.

one or more bulletins on some phase of dairying, and in most instances these may be had for the asking. Address the dean of the agricultural college.

The Farmers' Bulletins of the United States Department of Agriculture referred to in this bulletin will cover most of the topics to be studied. Bulletins in this list will be sent free, so long as the supply lasts, to any resident of the United States, upon application to his Senator, Representative, or Delegate in Congress, or to the Chief of the Division of Publications, U. S. Department of Agriculture, Washington, D. C. Because of the limited supply, applicants are urged to select only a few numbers, choosing those which are of special interest, and ordering but one copy of each. When the free supply has been exhausted, a number are yet for sale. Apply to the Superintendent of Documents, Government Printing Office, Washington, D. C., who has these bulletins for sale at 5 cents each. Other publications of this department are for sale by the Superintendent of Documents, but these are more often technical bulletins, and of interest to those only who wish to specialize in the subject.

Frequently revised classified lists of department publications on different phases of agriculture, one of which is on the subject of dairying, are issued by the Division of Agricultural Instruction, States Relations Service, U. S. Department of Agriculture, for teachers' use. The teacher will find that a number of the textbooks on dairying are suited to her needs, and that some of the elementary textbooks may be used by the pupils. Dairy cattle breeders' associations and dairy equipment concerns publish some interesting literature that may be had for the asking. Usually one or more dairy journals will be taken in the community, or a general farm paper with a well edited dairy section. Pupils should be encouraged to bring these to school. Clippings may be made of articles of interest and filed carefully. An easy and effective system of filing is to use pasteboard cases, which may be purchased or made by the pupils from pasteboard boxes, and to file the bulletins in these boxes by subject.

In addition to the Farmers' Bulletins and other Department Bulletins, the Dairy Division, Bureau of Animal Industry, issues a number of circulars on various phases of dairying which may be obtained directly from that division.

THE SURVEY.

One of the means by which the teacher may become informed about the dairy interests of the district is a dairy survey. The pupils may assist in obtaining this information, but a first-hand knowledge obtained by the teacher will be a valuable aid.

This survey should include the kind of farm (crop or stock farm), purpose of dairy cows (commercial or home use), breed of cattle,

feeds raised on farm, feeds purchased, records kept, milk tested, how milk is disposed of, and dairy conveniences. This information may be collected and tabulated.

A map of the district may be procured, or, if not available, one can be drawn on a large sheet by the pupils. On this map the homes and farms of the pupils are to be located. Place signs, emblems, or colored bits of paper to represent various facts from your tabulations; for example, colored circles to represent dairy breeds, squares to represent milk disposal, etc. Additional facts may be placed on this map, taking especial note of new cows, improvements, etc.

ILLUSTRATIVE MATERIAL.

Construct a chart showing the points of a typical dairy cow. On a large card mount pictures of the different breeds of dairy cows. Construct charts showing relative milk production of the cows of a herd; also one showing the percentage of butter fat from different cows. Preserve notable dairy records. Make diagrams showing the food value of milk; others comparing the food value of milk with that of other foods. Samples of feed raised or used in the district may be placed on exhibit. Make drawings showing a section of a model dairy barn; of a model milk house.

Pupils may construct actual models of dairy barns, models of stalls, stanchions, feed racks, etc. Drawings may be made or illustrations cut from magazines and papers and pasted on cardboard sheets showing by comparison the food value of a quart of milk with certain portions of other foods. (Farmers' Bulletin No. 363.)

Milk pails of various sorts may be borrowed from homes in the district or from dealers. If possible, dairy cows of different types may be brought to the school grounds and studied first hand. The teacher should enlist the services of the county agent in this work.

Write to the Division of Agricultural Instruction, States Relations Service, U. S. Department of Agriculture, Washington, D. C., for lists of lantern slide sets with lecture syllabi on the different phases of dairying. These sets of slides are loaned to teachers free of charge.

THE HOME PROJECT.

It is agreed by teachers of agriculture that instruction in that subject should follow certain definite lines: (1) It should be seasonal. (2) It should be local in its interests and development. (3) It should meet the interests of the pupils. (4) It should be practical. The home-project plan affords the best means of meeting these conditions, especially the practical side. The pupil is working out for himself the principles and theories taught in the classroom.

The term "home project," applied to instruction in elementary and secondary agriculture, includes each of the following requisites: (1) There must be a plan for work at home covering a season more or

less extended. (2) It must be a part of the instruction in agriculture of the school. (3) There must be a problem more or less new to the pupil. (4) The parents and pupil should agree with the teacher on the plan. (5) Some competent person must supervise the home work. (6) Detailed records of time, method, cost, and income must be honestly kept. (7) A written report based on the record must be submitted to the teacher. This report may be in the form of a booklet. The club project should be identical with the home project from the school point of view.

FIG. 1.—Contrasted milking quarters.

The home-project work may take two distinct directions in this series of lessons. One, project A type, will be the business phase of the subject of dairying and will include clean milk production, weighing and testing, marketing, computing profit and loss, inspection of the herd, judging, and purchasing. The other, project B type of work, will bear a close relation to the home and will develop more the home economics side. It will begin with the production of clean milk and include care and handling, manufacture of dairy products, use of milk in the home, food values, use of by-products of milk, and cooking with milk.

The general dairy practice of the district will in some measure determine the direction of the project, although the second type of home project is important to develop in any dairy community.

LESSON I. PRODUCING CLEAN MILK.

Sources of information.—Farmers' Bulletins 602, 748, 976, and 1019. Department Bulletin 642. Bulletins from the State agricultural college.

Topics for study.—Meaning of clean milk: If milk is kept comparatively free from bacteria at source of production and is kept cold, the chances are good of its reaching the ultimate consumer carrying only a comparatively small number of bacteria.

Types of bacteria in milk: Upon what does the number of bacteria in milk depend?

Sources of milk contamination: From the udder, dust in air and on udder and flanks of cow, the milker, unclean milk utensils, impure water supply, and disease in the herd. (Fig. 1.)

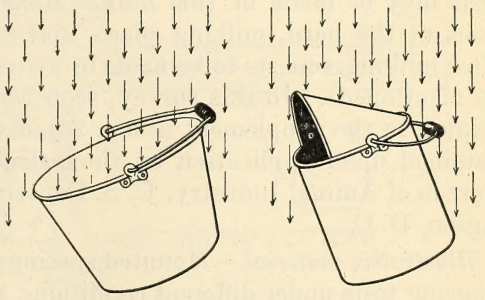

FIG. 2.—Two types of milk buckets: (A) Open top, undesirable; (B) top partially covered, desirable.

Importance of clean milk: Less danger to the consumer of contracting disease, keeps sweet longer, and makes higher grade of products.

Relation of milk to health: Unclean milk sometimes cause of outbreaks of epidemics; clean milk important to the producers; protection to health of family; better prices for milk; satisfied customers.

How to obtain clean milk: (1) The care of the cow—health, test for tuberculosis, condition of udder, external condition, dirt on body, grooming, washing, clipping, bedding, disposal of manure, feed, fresh water.

(2) The stable—location, surroundings, drainage, ventilation, sunlight, floors, stalls, cleanliness.

(3) The milkhouse—location, arrangement, ventilation, cleanliness, equipment, water supply, etc.

(4) Utensils—material, cleaning, sterilizing, need of cleaning.

(5) Milking—where cows should be milked; care of cow before milking (grooming and cleaning); preparation by the milker (clothing, hands, milking-stool, milk-pail); types of pails (fig. 2); dry hand versus wet hand milking. Stress importance of the milker's health and the danger of contagious diseases being transmitted by the milk.

(6) Cooling milk—water tanks, ice houses. (Write Dairy Division, Bureau of Animal Industry, U. S. Department of Agriculture, for information.)

Practical exercises.—Cleaning cow stable, brushing and washing cow before milking.

Care of milk utensils, seeing that they are properly washed, sterilized, and aired.

Testing of milk, as follows: Take a sample of milk from a cow whose flanks and udder have not been cleaned and another from a cow that has been cleaned. Set them together and note which sours quicker. Make sediment test as follows: Strain a quart of milk through absorbent cotton and note the sediment collected on the cotton (sediment tests may be made of the milk of the cows from different farms); carefully dry these cotton pads and place them on exhibition. Compare the sediment tests. Account for the different results. If there is a commercial dairy in the district, sediment tests may be made of this milk. Make survey of sanitary conditions of the barn, milking place, and place where milk is handled after milking, reports to be made in writing (owners' names need not be mentioned). In this survey, score the farms using the score card printed in the supplement (see p. 28), extra copies of which may be obtained upon application by the instructor to the Dairy Division, Bureau of Animal Industry, U. S. Department of Agriculture, Washington, D. C.

Illustrative material.—Mounted specimens of sediment tests (fig. 3), showing tests under different conditions, may be made by pupils and teacher. Pictures of model dairy farms and dairy barns may be mounted on pasteboard. Samples of various forms of milk pails may be borrowed from either a dealer or from homes in the district. These may be brought before the class and inspected. In case neither are available, drawings of these pails can be made and mounted for class use.

Home projects.—The production of clean milk will lend itself to either project A or project B. Students should now select the type of project they are to work out, and begin with the production of clean milk. Practicums may include milking the cow under sanitary conditions, care of the stable, and care of the milk vessels.

Correlations.—A written report of a visit to a dairy barn or farm, with special attention to the production of clean milk, will make a good lesson in language. Other reports on tests for sediment, and on clean dairy practice, will also be of use in language classes. A booklet prepared on the entire lesson, with a record of the dairy practice of the community, will make an excellent language project.

The pupils may assist in the preparation of illustrative charts giving practice work in drawing.

A discussion of bacteria, both harmful and useful, their methods of growth and reproduction, how they cause disease, the manner in which they are carried from place to place, the ways in which they enter the body, and methods of control and prevention may be studied with profit in the subject of physiology and hygiene.

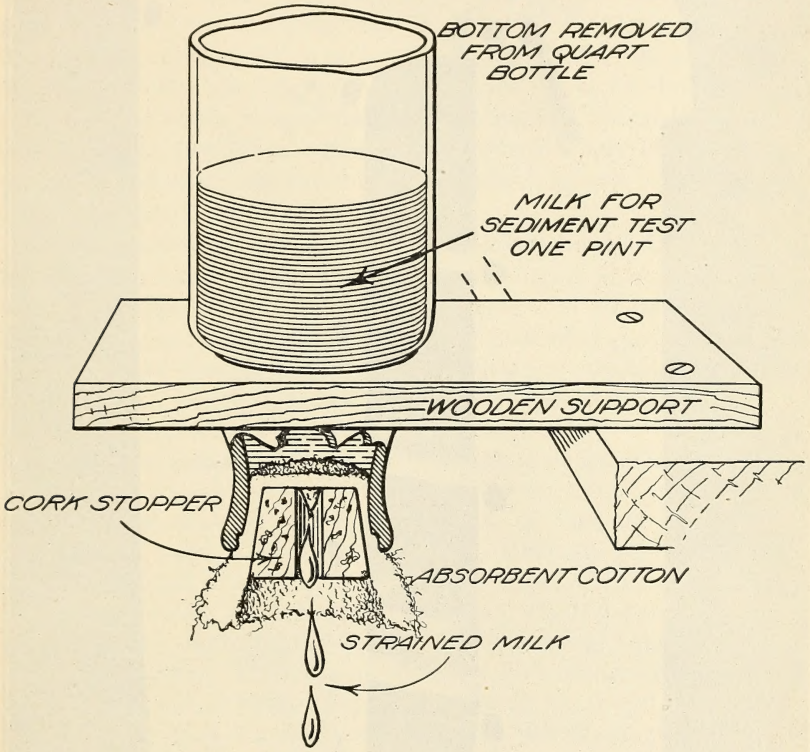

FIG. 3.—Simple apparatus for sediment test.

LESSON II. THE CARE OF MILK AND CREAM.

Sources of information.—Farmers' Bulletins 413, 490, 602, 623 689, 748, 976, and 1019. Bulletins from the State agricultural college.

Topics for study.—The milk producer having done his duty in delivering clean milk to the home, it then depends much upon the care and handling as to how long it will remain sweet and free from contamination.

How milk becomes unfit for food: (1) Placing it in unclean vessels. (2) Exposing it unnecessarily to the air. (3) Failing to keep it cold up to the time of using it. (4) Exposing it to flies. Discuss these sources and methods of handling in each case, and the tendency of milk to absorb bacteria, odors, and other impurities. Avoid having uncovered milk in close contact with food of any kind, especially strong-smelling foods.

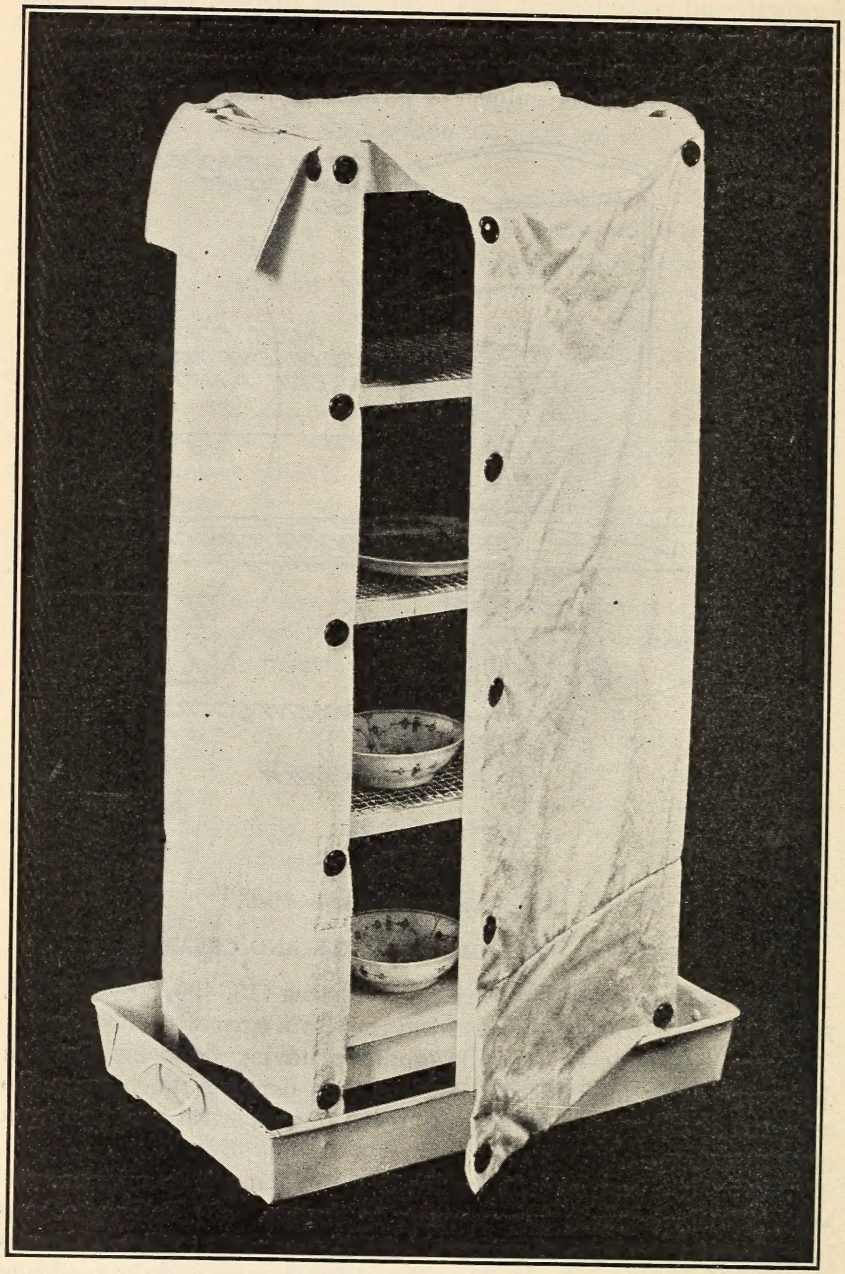

FIG. 4.—The iceless refrigerator.

Care of milk after milking: Straining—discuss best methods. Cooling—need of; how done. Coolers—the refrigerator, homemade cooler (fig. 4); care of the refrigerator; dangers of an unsanitary one. Care of vessels—cleaning, sterilizing. (See Farmers' Bulletin 748 for a simple sterilizer for utensils.)

Practical exercises.—Have some samples of clean milk brought to school and experiment with them as follows: Place some milk (1) in an unclean bottle, (2) in a bottle in which the milk is exposed to open air of schoolroom, (3) in another in which flies have been, and (4) in a bottle which has been thoroughly boiled for 5 minutes and carefully closed up. Place these bottles where other conditions will be equal, and note the time it takes each to sour and the changes that take place in each sample.

Have samples of various kinds of strainers brought to school. Strain milk samples through each, making a sediment test after straining, comparing each with the same test of unstrained milk. Dry the cotton pads and mount same with a label, giving description.

Pupils may construct under the teacher's directions a homemade refrigerator. In case the home has no refrigerator, the construction of one for the home may be made a short project.

Visit the creamery and note the methods of handling and cooling milk or cream, making a written report of the trip.

Illustrative material.—Collect samples of various kinds of milk bottles and covers, milk vessels, and strainers of various types. Clip and mount illustrations from dairy supply catalogues and farm journals, showing modern milk utensils. (Refrigerator dealers will provide ample material for the study of the refrigerator.)

Home projects.—The care of the milk and cream on the farm will be a part of either home project A or B, or the pupil may take this lesson alone as a shorter project. This would be practical if the milk was not prepared and sold. If the whole milk was marketed, then the handling and bottling and marketing of milk could be assigned as a project.

Correlations.—For language: A booklet on the care of milk in the home, illustrated by drawings or clipped pictures; reports neatly written of work done in practical exercises, and how the home takes care of milk and cream; report of the visit to the creamery.

For drawing: Sketches of equipment for handling milk, milk bottles, vessels, and strainers, mounted on cardboard, will give practical work in drawing.

LESSON III. WEIGHING.

Sources of information.—Write to the Dairy Division, Bureau of Animal Industry, United States Department of Agriculture, for information. Consult with the dairy department, State college of agriculture; also with the county agent.

Topics for study.—To build up a herd of cows intelligently and to eliminate those that are not paying their way, it is necessary to keep adequate records of production, feeding, and breeding.

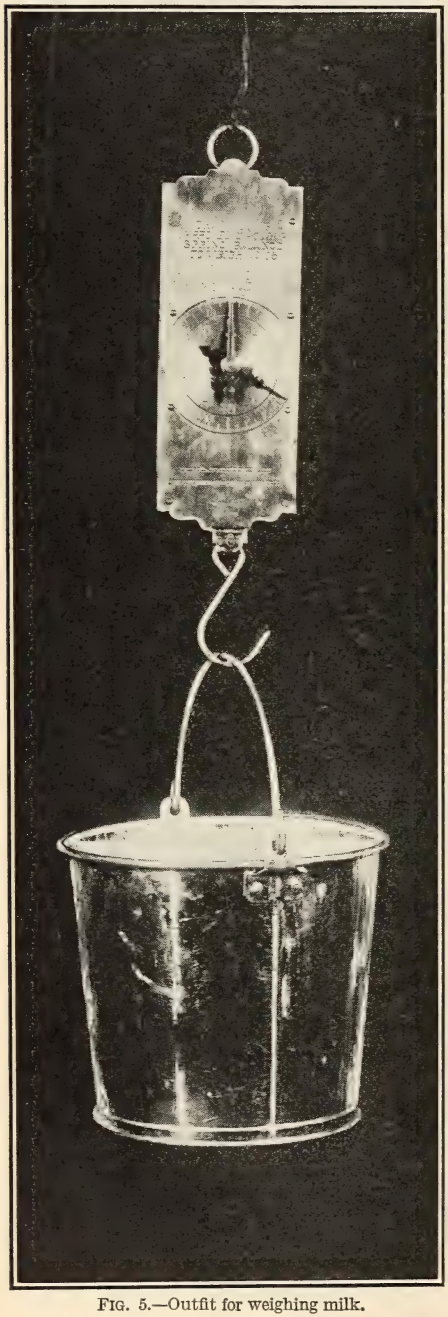

FIG. 5.—Outfit for weighing milk.

A simple piece of home work under direction may be developed so that the farm children may have valuable problems and at the same time obtain results that will be useful to the parents. Such a plan will establish a point of contact between school, home, and the child.

The equipment for weighing is simple, consisting of a spring balance reading in tenths of pounds (fig. 5), costing $3 to $5 if bought new, and a series of record sheets, which may be ruled by the pupil himself. What cows are being tested in the district? State the advantages of a milk record. How often should the milk be weighed?

Practical exercises.—Encourage the pupils to adopt the practice of weighing daily the milk of each cow. A contest in milk production will stimulate interest. Duplicates of the record sheets may be posted side by side in the schoolroom, where the pupils will have an opportunity of comparing records.

Illustrative material.—Copies of milk records of the best dairy cows may be obtained and posted in the classroom for inspection. The records made by the pupils may be compared with these records.

Charts showing a comparison between the records of these champion cows and the best cows of the district may be made by the pupils.

Home projects.—The weighing of milk and keeping a record of the same belongs to project A type, and may be assigned alone as a short-time project.

Correlations.—Construct various problems showing the difference and the percentage of difference in the weekly and monthly milk record of two or more cows; others showing the percentage of gain or loss in the milk record of a cow in consecutive weeks or months.

LESSON IV. TESTING.

Sources of information.—Bureau of Animal Industry (U. S. Department of Agriculture) Document A–12, Chemical Testing of Milk and Cream.

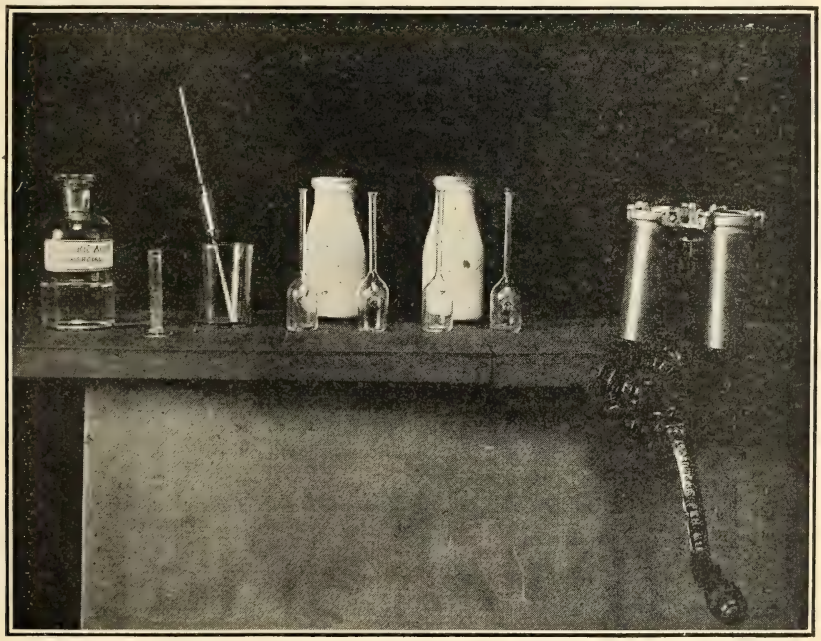

FIG. 6.—Outfit for testing milk.

Topics for study.—A simple Babcock tester should be a part of the equipment of every rural school (fig. 6). A machine may be purchased for a small sum or, in case no fund for its purchase is available, one can probably be borrowed from some dairy farmer in the district.

Require the pupils to bring to school samples of milk and give them practice in testing milk. First have the test made by two students, and be certain the entire class understands each step in the process. Then divide the class into groups and supervise them until they are reasonably accurate, using milk from one cow only as a check. When they have learned to make the test accurately,

they should select carefully samples of milk and make the test to determine the value of the cows at home as butter-fat producers.

The members of the class having Babcock testers at home should be required to make reports on the tests made. (*Caution.*—Too much emphasis can not be placed upon the danger of burns from the careless handling of sulphuric acid. Pupils should be warned to be very careful in handling it.) Give the pupils opportunity to test the milk at home regularly, and encourage them to combine the records of weighing milk at home with these tests at school to find the butter-fat production of each cow.

Practical exercises.—A junior cow-testing association may be organized among the members of the class. The cows at home may be tested by the class, observing the rules of the association and keeping records of same.

Illustrative material.—Construct charts showing the comparative amounts of butter fat in the milk of different cows; others showing the total amount produced in a given period; others showing the records of the best cows of the district.

Home projects.—Project A will require the testing of the milk of the dairy cows. For other projects, the weighing and testing of a dairy cow for a long or short period; the testing of the milk of a dairy herd and keeping the records.

Correlations.—Write up reports of the milk tests made at school and at home. Have the pupils make sketches of the parts of the milk-testing equipment, and charts showing quantity of butter fat in the milk of different cows.

Find how many pounds of butter fat in 3,000 pounds of milk testing 4.2 per cent.

A farmer has 12 cows in his dairy herd, each averaging 25 pounds of milk daily. How many pounds of milk does he get in 30 days? If the milk tests 4.3 per cent butter fat, how many pounds produced each day; for the 30 days? Find its value at 37½ cents per pound.

Develop similar problems from information gathered at home.

LESSON V. RECORDS AND MARKETING.

Sources of information.—State agricultural college bulletins.

Topics for study.—This lesson follows naturally after the lessons on weighing and testing. The three are so closely related that one can not be taught successfully without the others. It would be the best thing for the teacher to teach these three lessons as parts of a unit.

Review briefly the methods of weighing and testing. Discuss the advantages of each. Suggest that neither could be of any permanent

service unless records were made. Discuss how and when to make records. Suggest simple forms for the pupils to make. In what form is the milk of the district sold? Are any provisions made for cooperative marketing? What special provisions have been made for selling butter? Is the milk sold locally or shipped to other markets? If shipped, to what markets does it go?

What are the regulations in your district concerning the handling of milk? What devices and sanitary conveniences have the dairy farms for the handling and marketing of milk?

What is the amount and value (estimated) of the milk sold in the district? Of the cream? Other dairy products? Make a comparison between the amount of milk produced and the amount marketed.

Practical exercises.—Require the students to rule their own forms and to keep records of both weights of milk and percentage of butter fat, making separate records for each cow in the herd. This may be extended over a period of time making a good home project. In addition to the milk and butter fat record a feed record may also be kept.

Problems.—A farmer has two cows, each producing 6,000 pounds of milk yearly. The first cow's milk yields 3.2 per cent butter fat, and the second, 5.8 per cent. What is the difference in fat produced by the two cows? Suppose the fat is worth 37½ cents per pound. What is the money value of the butter fat yielded by each cow?

The same farmer has two other cows. The first gives 8,000 pounds of milk testing 3.2 per cent butter fat; the second gives 5,000 pounds of milk testing 5.6 per cent butter fat. Which is the more valuable cow? Construct other problems, using local records.

Home project.—The home project of type A may be assigned to the pupil beginning with the production of clean milk, and ending with the marketing of the same, keeping all records and summarizing at the close of the project period, which may cover several weeks, showing the total cost of production, gross returns, and net profit or loss.

LESSON VI. PROFIT AND LOSS—GOOD AND POOR COWS.

Sources of information.—Farmers' Bulletins 578, 589, 743, 893, and 993.

Topics for study.—The final results of testing and weighing the milk production of a dairy cow will be to determine whether she is not only paying her way but also returning to her owner a fair margin of profit. These facts may be definitely discovered by comparing milk records with feeding records and other costs, and striking a balance to determine losses or gains.

Impress upon pupils (1) the need of records and tests; (2) the importance of studying the records, drawing comparisons and striking balances, with the final end in view of determining whether the dairy cow in question is worthy of her keep.

How many cows in the district whose records are being kept? How many farms that keep dairy cows? Are the pupils keeping records at home? What organizations among the local dairy farmers? Suggest the organization of a cow-testing association.

Practical exercises.—Comparative charts showing the standing of two or more cows in milk production, pounds of butter fat and cost of feed, may be made by the pupils, using data they have obtained

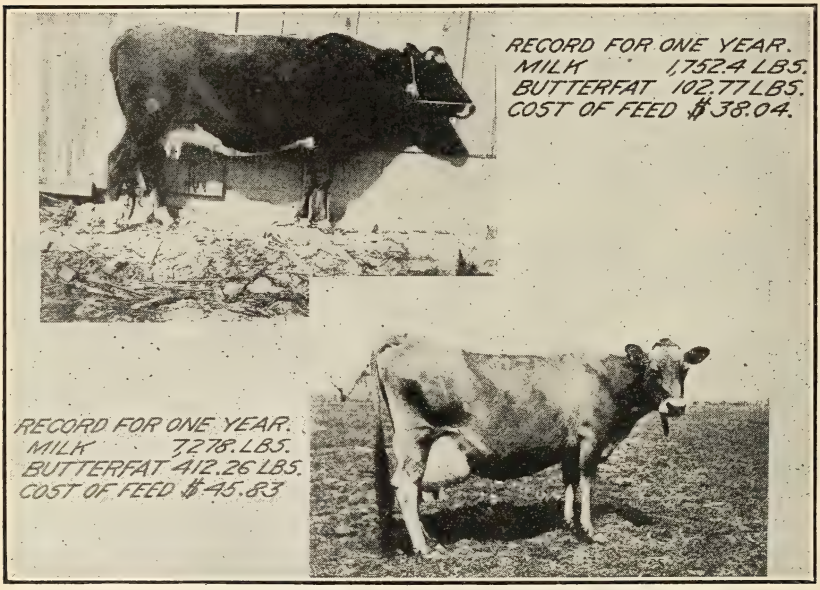

FIG. 7.—Contrasting types of dairy cows.

from their own work in preceding lessons. Problems on costs, production, profits, and losses should be constructed, the aim of this lesson being to impress forcibly the need of knowing what the dairy cow is really doing, thereby eliminating the unprofitable cow, or having an opportunity to develop the profitable one. (Fig. 7.)

LESSON VII. JUDGING AND PURCHASING.

Sources of information.—Farmers' Bulletins 355, 743, and 893. Department Bulletin 434.

Topics for study.—The unprofitable cow being discovered, the problem now is one of discarding the nonpayer and purchasing the profit-making cow.

A brief study of the types of dairy cows and of the points of a dairy cow should be made. (Fig. 8.) Send to your State agricultural college or the U. S. Department of Agriculture for a score card for dairy cows, and study it carefully.

Chief breeds of dairy cows: Origin, characteristics of each, milk and butter fat records.

The points of a good dairy cow.

The champion milk and butter fat records in the United States. The amount of milk produced, together with the percentage of butter fat in same, determines the value of the cow.

Sources of income: Milk and butter fat. Market requirements.

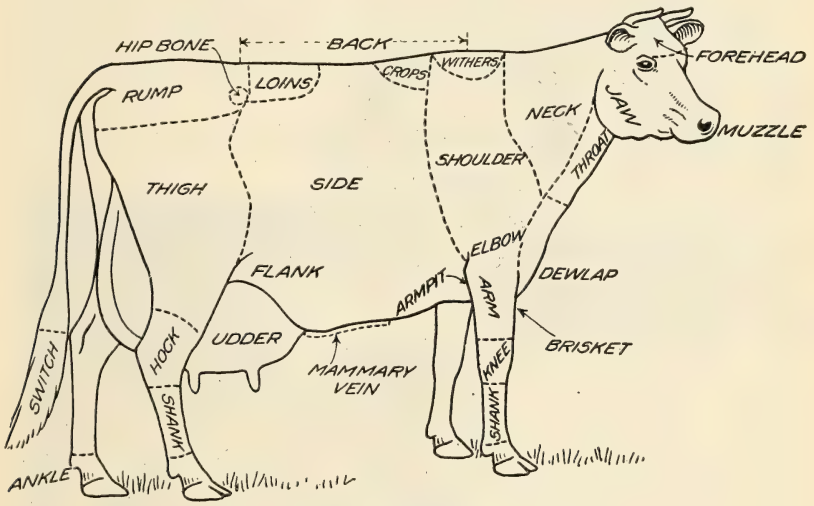

FIG. 8.—Chart showing the parts of a dairy cow.

Breeds prevailing in the community; personal preference; nature of the country and climate; current price; estimate of the future of the breed.

Practical exercises.—Visit a dairy farm in the district and make a study of the types of dairy cattle. Secure cooperation of county agent for exercises in judging dairy cows. From the dairy survey prepare a report showing the number and breed of pure-bred cows, grades, and scrubs. Make a study of the milk and butter produced by these cows. What breed of dairy cow most common in the district? Is there any special reason for this? What herds could be improved? How many farms have pure-bred stock? What breed is your cow?

Illustrative material.—Cut out pictures of dairy cows of different breeds, mount them on cardboard, and paste below a brief description of the cow as to origin, records, etc. Collect and mount pictures of

famous dairy farms. If there be any good dairy farms or herds in the district, apply to the owner for photographs of his cows and farm.

If possible, make local photographs of the profit-making cows and the nonpayers and mount them together with their records on the same card.

Home projects.—Project A will be well nearing completion when the dairy herd is culled and selected. A good type of project will be to weigh, test, record, and make comparisons between cost and production to be in position to discard the cow that does not pay a profit.

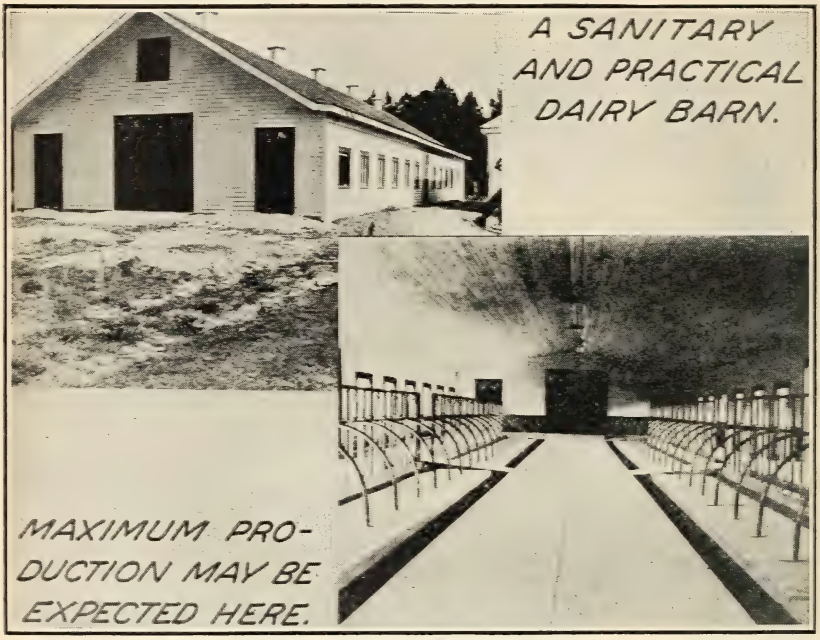

FIG. 9.—A good type of dairy barn.

Correlations.—Compute the value of the dairy cows of the district. Make an estimate of the value of the milk produced in one month.

Compare the purchase price of a good dairy cow with the net value of her milk production for a year; estimate the percentage of profit she pays on the investment.

Make out a written report on the different breeds of dairy cattle in the district. Locate the original homes of these breeds. On a map of the United States locate the chief dairy sections, and find out, if possible, the prevailing type of dairy cattle in each section.

What noted dairy herds in your State? What breeds are they?

LESSON VIII. CARE AND HANDLING OF THE DAIRY COW AND BARN.

Sources of information.—Farmers' Bulletins 578, 602, 689, and 777. Bulletins from the State college of agriculture.

Topics for study.—Care of the cow: The cow must be in good health; tests must be made for tuberculosis.

Comfort: Roomy quarters; clean bedding. Feed: Clean, wholesome feed; balanced rations. (Avoid moldy and decayed feeds.) Water: Clean and fresh; free from contamination; provisions for warming in cold weather.

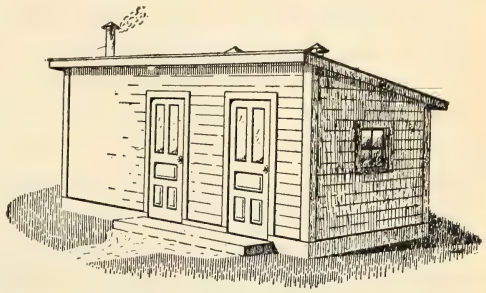

FIG. 10.—An inexpensive sanitary dairy house. Perspective view.

Regular handling: Feed and milk at definite hours. If a change of feed is made, make this change gradually.

Pleasant surroundings: No ill-treatment or abuse, scolding or chasing. Is the practice of sending the dog to chase up the cows at milking time a good one?

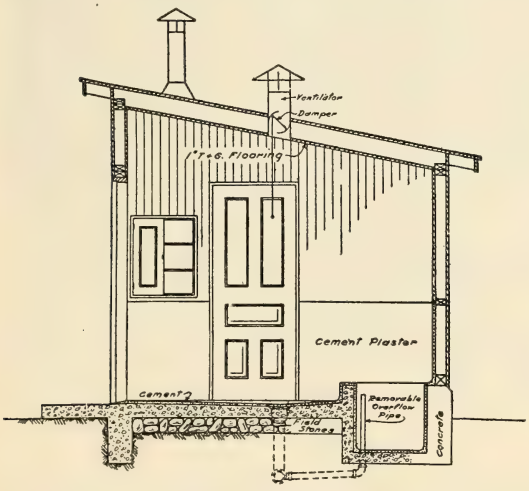

FIG. 11.—Cross section through dairy house shown in figure 10.

The barnyard: Dry, well drained, clean, south exposure, protected from winds.

The stable (fig. 9): Located on high ground; good natural drainage; free from places where flies may breed; provisions for removal of manure; separation of cows from other animals by a tight partition, walls and ceiling tight; 4 square feet of glass to each cow; ample ventilation; floors kept clean by sweeping and washing, walls kept free from dirt; stalls comfortable and easy stanchions provided.

The milk house (figs. 10, 11, and 12): Location—convenient to stable, but free from dust and odors, and well drained. Purpose—to provide a place where dairy products may be handled; planned to save labor. (Farmers' Bulletin 689 shows a good plan.) Cleanliness

always kept in mind—concrete floors, round edges; tight ceilings; screened doors and windows; plenty of sunlight; ample supply of cold running water, clean and convenient.

Practical exercises.—Inspect a dairy barn or stable for the points mentioned, making a written report on the same. Similar reports may be made on the barns and stables of the district, names being omitted, and the reports being written. Similar reports can also be made on the care and treatment of the cow.

Make models of sanitary dairy barns, stalls, stanchions, milk houses and a list of equipment. Make trips to various milk houses. Note the handling of commercial milk both by the dairies and farmers.

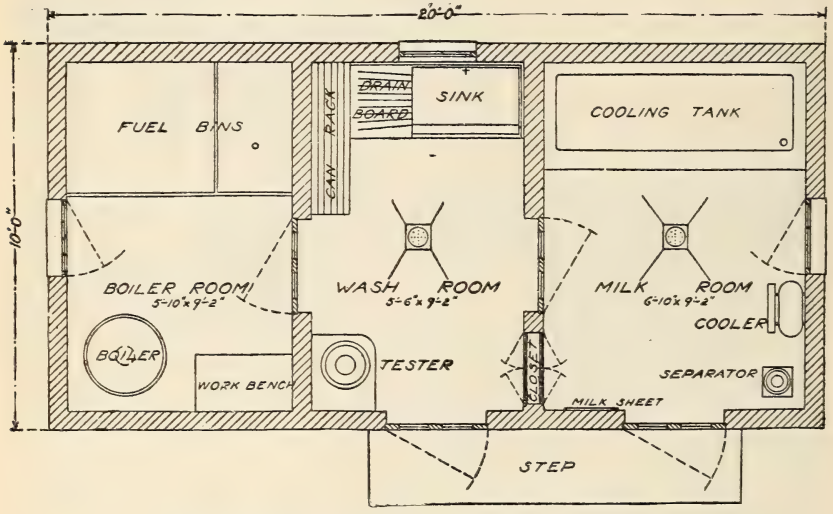

FIG. 12.—Floor plan of dairy house, showing general arrangement.

Draw a plan of the arrangement of the stables inspected, and compare this plan with the plans of a model dairy barn. (Write to the U. S. Department of Agriculture and to the State agricultural college for bulletins and other information about dairy barns and milk houses.)

Correlations.—Prepare reports in the form of booklets on the correct care and handling of the dairy herd, and contrast this with the general method of the district.

Write up a report of a visit to a dairy farm. Prepare a report on the general conditions in the district concerning places of handling milk.

Make drawings of some of the stables of the district. Prepare a plan of a dairy barn of the district, and, by way of comparison and contrast, make a copy of the plan of a model barn, plans of which may be obtained from the State agricultural college.

LESSON IX. BUTTER MAKING.

Sources of information.—Farmers' Bulletin 876. State college of agriculture bulletins.

Topics for study.—Extent and importance of butter making on the farm. Quality and preparation of cream. Cream separation methods—gravity, shallow pan, deep setting, dilution, centrifugal. What is the chief disadvantage of the dilution plan? Discuss advantages of each plan.

Cream separator—kinds, location, setting up, running, cleaning. When is it advisable for a farm to own a separator?

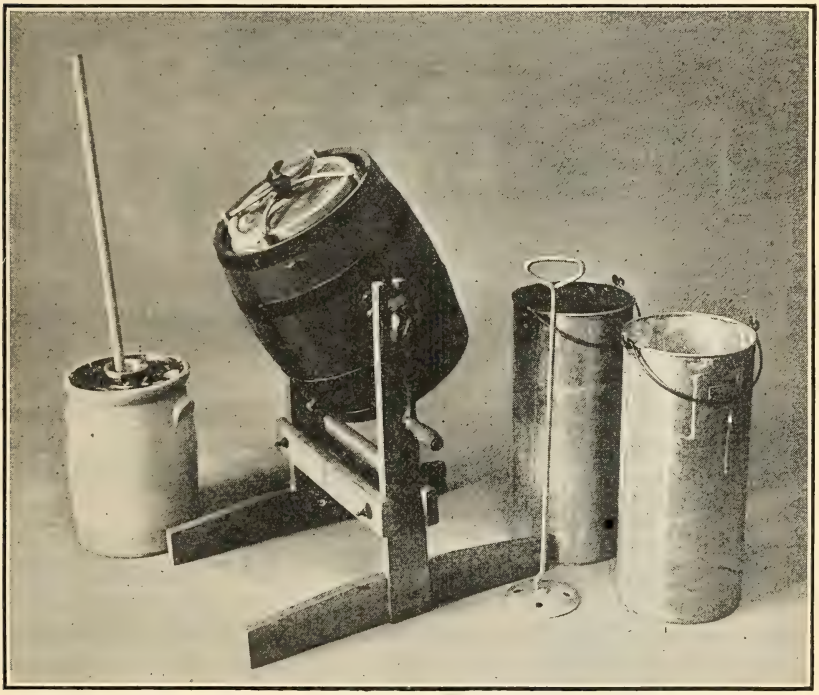

FIG. 13.—Apparatus for butter making.

Cooling the cream—various methods; an inexpensive plan for the farm home; ripening; usual plan; cause of souring; importance of correct temperature and proper ripening; creamery methods of ripening; the "starter" method, directions for making and using.

Churning—time, temperature; results of too high a temperature; preparing the churn; adding color; churning; difficult churning.

Preparing the butter for use—washing, salting, working; discuss each.

Show results of butter not properly washed, salted, and worked. The package. Equipment for farm butter making. (Fig. 13.)

Summary of steps in butter making.

Practical exercises.—With small shallow pans and with deep bottles using the same amount of milk from the same cow, demonstrate the difference between shallow pan and deep setting methods of separation. If possible, secure the loan of a cream separator from a dealer, or borrow one from a home in the district. Make a study of the parts of the separator, having the class become familiar with its parts. Demonstrate its use. Give practical demonstration of running the separator and of cleaning its parts after use. Impress upon the pupils the need of keeping it thoroughly clean. If a small churn can be borrowed, an exercise in churning should be given, followed by a demonstration in washing, salting, and working the butter.

A visit to the grocery stores will show very clearly the advantage of the neat package, both as to appearance and as to price of the butter per pound. A butter-making contest may be held, and the butter judged by a score card, copies of which may be obtained from the State agricultural college, or use the one suggested on page 29.

This contest may also be developed into a community contest, inviting the parents to take part. It should be held at the schoolhouse. The assistance of the county agent should be obtained. A practical demonstration of correct butter making should be given, and at the same time the modern butter-making equipment should be assembled. The dealer will usually leave with the teacher any or all of the equipment.

Home projects.—The use and care of the separator for a given period. If no separator is available in the home, then the pupil may separate the cream by one of the other processes, preferably the deep-setting method, writing up an account of her work.

Ripening the cream, churning and preparing the butter for either sale or table use may be given to the pupil for a useful project. Where butter making is the manner in which the milk is disposed of, a butter record of the dairy cows, comparing the income therefrom with the cost of feed, or a comparative study extending over a period of 60 days, showing the results from the sale of cream with those from the sale of butter, may be made.

Correlations.—If the milk has been tested for butter fat, problems showing the difference between the butter fat in a given weight of milk and the actual butter produced from the same weight, and the percentage of gain or loss should be computed. Problems showing the income from the sale of whole milk and the sale of butter should be made, and others showing the relative incomes from the sale of cream and the sale of butter, taking into consideration only the amount of each produced and the sale price.

The pupils may write up a description of a separator and its use. They may prepare a booklet on butter making, a neat cover design,

and write up the various steps in butter making, illustrating these steps either by original drawings or by pictures clipped from various sources.

LESSON X. FOOD VALUE OF MILK. ITS USE IN THE HOME.

Sources of information.—Farmers' Bulletins 363, 413, 717, and 824. Bulletins from the State college of agriculture.

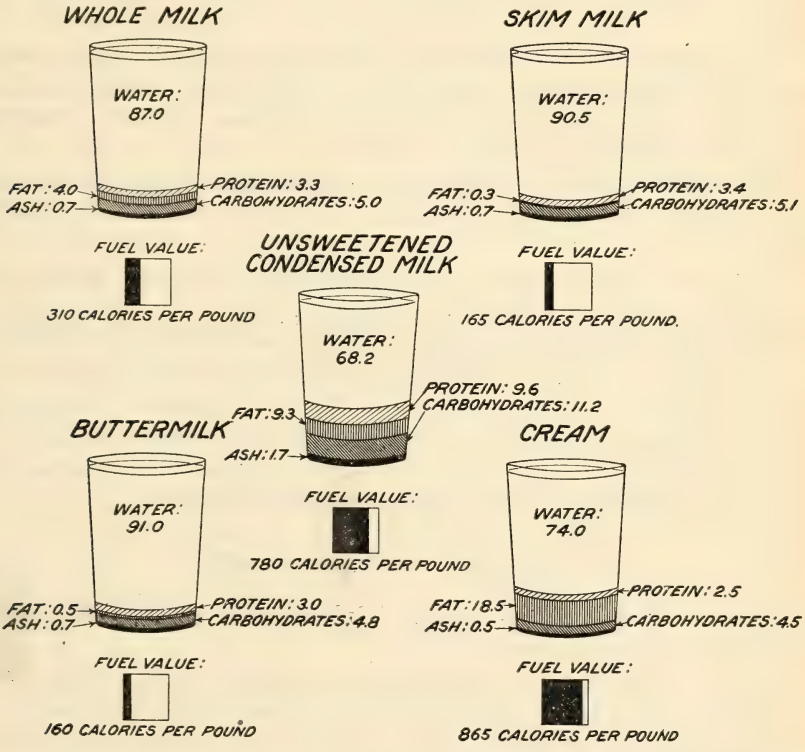

FIG. 14.—Percentage composition and fuel value per pound of whole milk and some milk products. The constituents are expressed in per cent, the fuel values in calories per pound.

Topics for study.—Kinds of milk. Composition and characteristics of whole milk, skim milk, condensed milk, buttermilk; flavor. Importance of clean milk. Sources of dirt. Milk as a disease carrier.

Methods of preserving milk—cold, heat. What are the advantages and disadvantages of each method?

Digestibility of milk; compared with other foods. Review the process of digestion. Relative value of cooked and raw milk. Milk for infants—special infant foods.

Compare nutritive value of milk with other common foods. (Fig. 14.) Of what food value is skim milk? Compare costs of nutrients

in milk with those in other foods. What can you say of the cost of milk as a food when compared with other foods? Compare the food value of a quart of milk with meat and eggs and reach a conclusion as to the economy in the use of milk as a food.

Use in home—milk dishes; in bread, soups, desserts, milk products, butter, cheese, buttermilk, whey, clabber, and fermented milk products.

Practical exercises.—Construct a chart showing the composition of milk; another showing comparative food values of milk and other foods.

Make a report on the amount of milk used as food in the homes of the district, and state the ways in which it is used. Determine also what milk products are used as a food in the home. How is the skim milk disposed of?

Illustrative material.—Secure from manufacturers samples of milk foods and forms of commercial milk products. Place these on exhibition.

Construct a chart showing the composition of milk. Make up a collection of recipes wherein milk is largely used. Construct a chart showing the ways in which milk and its products may be used as food.

Correlations.—The preparation of milk dishes both at home and in school affords work for the class in home economics. A study of foods and food values belongs both to home economics and physiology. In the physiology class, a study of digestion in general, and tracing the digestion of milk will give a valuable lesson.

LESSON XI. COTTAGE CHEESE.

Sources of information.—Farmers' Bulletins 363, 413, and 850. Office of Secretary Circular 109.

Topics for study.—Cottage cheese as a desirable food. Quality and requisites—quality of milk the first consideration; clean utensils.

A simple process for home use—souring, forming the curds, cutting, heating, straining, working, flavoring, and storing. Use of starters—homemade, commercial. Pasteurization.

Cottage cheese making on a large scale—setting, cutting, heating and stirring, drawing and salting; making cheese with rennet and pepsin; yield of cheese; marketing; home equipment.

What is the food value of cottage cheese? Suggest combinations with other foods that will restore the balance. This will lead to the preparation of special cottage cheese dishes in combinations with other foods. This is an excellent way to use skim milk.

One hundred pounds of skim milk fed to hogs produces 4.8 pounds of dressed pork, while if made into cottage cheese, it will produce 15 pounds of cheese, and will furnish nearly seven times the amount of

protein and nearly as much energy. Therefore skim milk should be used as a human food, and only the excess fed to farm stock.

Practical exercises.—Cottage cheese may be made in the schoolroom. The milk may be donated, and the equipment needed may either be donated or purchased. The cottage cheese thus made may be used for a part of the school lunch.

For a practicum, the students may make cottage cheese at home, making a written report upon the process. A "Cottage-cheese week" campaign may be held and not only the pupils, but the housewives should be encouraged to make and use cottage cheese during the week. Charts can be made showing the comparative value of cottage cheese with other foods. Assemble a model equipment for making cottage cheese.

Correlations.—The use of cottage cheese in connection with the daily meals; cottage cheese in combination with other foods to make a balanced ration.

All these may be worked out in connection with the lessons in home economics.

LESSON XII. THE USE OF MILK AND ITS PRODUCTS IN COOKERY.

Sources of information.—Farmers' Bulletins 363, 413, 487, 717, 824, and 850.

Topics for study.—Review food value of milk. Discuss value of milk as a food for children.

Ways to use milk in cooking—white sauce, milk soups, chowders, cereals cooked in milk, and desserts made from milk.

Skim milk—nutritive value; uses—in general cooking, for cottage cheese and whey or clabber.

Cheese—comparison with other foods; food values; its economical use in the diet.

Cheese dishes in place of meat—cheese fondue (equal to a pound of beef), cheese soufflé (equal to a pound of beef and a pound of potatoes), baked rice and cheese (equal to one-fourth pound of beef).

Practical exercises.—Have the pupils make a list of recipes wherein milk and milk products are used in cooking; prepare another list wherein milk is used as a supplement to other foods. Some of the recipes may be prepared in the schoolroom, and used as a part of the school lunch; others are to be worked out at home. Especial attention is to be paid to the use of milk and milk products to supplement other foods.

A day may be set apart as "Milk food day," and small prizes given for the best display of dishes cooked with milk or milk products, and others for milk dishes used as a substitute. The patrons of the district should be invited and the county agent should be asked to be present and to lecture on milk.

Illustrative material.—Charts showing food values have already been suggested in former lessons. Sets of charts showing the comparative value of milk and its products may be made and will prove of service to the class.

Home projects.—This lesson offers home project work of the second type, and is closely related to similar work in home economics. Pupils may undertake projects of short time duration in cooking with milk or in using milk dishes or milk products. In either case, the work should be carefully written up, the recipes copied in the report, and a summary of the work made with some comparative costs and food value.

Correlations.—The study of foods and food values, milk, and its use as a food, may well be correlated with the lessons in physiology. The home economics class will find abundant material for practice work in this lesson. They may prepare the recipes suggested, copy them neatly on separate cards, and file them, one set being prepared for the school, and each pupil preparing a set for home use. Menus containing the balanced ration in which milk is largely used, may be planned and worked out both at home and at school. The preparation of other dishes to go with the milk dishes will form another series of lessons in home economics.

In language work, written exercises telling how the dishes were prepared, the careful writing up of the recipes, and reports on home project work will be found useful.

For arithmetic, a series of problems in which the cost of milk and eggs and the cost of is milk found and a comparison made, will be found valuable exercises.

SUPPLEMENT.

DAIRY COW SURVEY OF THE DISTRICT.

District..... Town..... State.....

Teacher..... Date.....

Pupils' survey committee.....

Farm and location.	Breed.	Number of cows.			Estimated value of each.	Sires.	Young stock.		Average production per cow.
		Pure bred.	Grade.	Scrub.			Pure bred.	Grade.	

DAIRY PRACTICE SURVEY.

Owner and location.	Feeding practice.				Average cost of feeding.	Milk disposal.							
	Feeds raised on farm.		Feeds purchased.			Total amount of milk.	Butter fat, per cent.	Whole milk sold, amount.	Cream sold, amount.	Butter sold, amount.	Home use, amount.	Fed to stock, amount.
	Roughage.	Concentrate.	Roughage.	Concentrate.								

DAIRY SURVEY—STABLE AND MILK-HOUSE CONVENIENCES.

The stable.							The milk house.						
									Equipment.				
Construction.	Drainage.	Floors.	Ceiling and walls.	Manure disposal.	Water supply.	Ventilation.	Construction.	Water supply.	Cooler.	Sterilizer.	Separator.	Milk pails.	Light, screens, and ventilation.

DISTRICT DAIRY COW SUMMARY.

Date.....

Breeds.	Number of cows.		Young stock		Purebred sires.	Total of breed.	Percentage of all.
	Purebred.	Grade.	Purebred.	Grade.			
Jersey							
Holstein							
Ayrshire							
Guernsey							
Scrub							
Total in district							

MILK AND FEED RECORD FOR THE MONTH OF ....., 19 .

Date of Babcock test..... Owner of herd.....

Address..... Name of reporter.....

Name of cow.[1]	Total milk.	Butter fat.	Butter fat.	Butter or cream.	Price per gallon.	Price per pound.	Value.	Value skim milk fed.[2]	Value skim milk sold.[2]	Total value.	Cost of feed.	Income over feed cost.	Feed for the month.					
													Hay.	Silage or soiling crops.	Grains fed.			Value of pasture.
	Lbs.	*Per ct.*	*Lbs.*	*Lbs.*	*Cts.*	*Cts.*	*Dols.*	*Dols.*	*Dols.*	*Dols.*	*Dols.*	*Dols.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Cts.*

Cost of feed per ton.	Note when cows freshen, dry off, are bought, or are disposed of.	Remarks.

[1] Enter also names of dry cows and cost of feed.

[2] Price of skim milk fed, ... cents per hundred; skim milk sold, ... cents per gallon.

NOTE.—The instructor may obtain sample sheets of this record by applying to the Dairy Division, Bureau of Animal Industry, U. S. Department of Agriculture.

DAILY MILK AND FEED RECORD FOR MONTH OF ....., 191 .

Owner of herd, ... Post office, ... State, ...

Name									
Breed									
Daily feed record	1–10	11–20	21–31	1–10	11–20	21–31	1–10	11–20	21–31
Pounds hay @ —— per ton									
Pounds silage @ —— per ton									
Pounds grain @ —— per ton									
Pounds ..... @ —— per ton									
Days pasture @ —— per month									

Date.	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.
1						
2						
3						
&c.						
30						
31						
Total						

Total for month	
Butter fat, per cent	
Butter fat, pounds	
Price per pound or gallon: Milk	
Price per pound or gallon: Butter fat	
Price per pound or gallon: Butter	
Price per pound or gallon: Cream	
Value	
Value skim milk @ — cents per gallon or hundredweight	
Total value	
Cost of feed	
Profit	

NOTE.—The instructor may obtain sample sheets of this record by applying to the Dairy Division, Bureau of Animal Industry, U. S. Department of Agriculture.

SANITARY INSPECTION OF DAIRY FARMS.

Score Card.

Indorsed by the Official Dairy Instructors' Association.

Note.—Reverse side may contain information concerning owner, number of cows, milk production and disposal, and inspection.

Equipment.	Score. Perfect.	Score. Allowed.	Methods.	Score. Perfect.	Score. Allowed.
COWS.			COWS.		
Health	6	.....	Clean	8	.....
Apparently in good health	1		(Free from visible dirt, 6.)		
If tested with tuberculin within a year and no tuberculosis is found, or if tested within six months and all reacting animals removed	5				
(If tested within a year and reacting animals are found and removed, 3.)			STABLES.		
Food (clean and wholesome)	1	.....	Cleanliness of stables	6	.....
Water (clean and fresh)	1	.....	Floor	2	
STABLES.			Walls	1	
Location of stable	2	.....	Ceilings and ledges	1	
Well drained	1		Mangers and partitions	1	
Free from contaminating surroundings	1		Windows	1	
Construction of stable	4	.....	Stable air at milking time	5	.....
Tight, sound floor, and proper gutter	2		Freedom from dust	3	
Smooth, tight walls and ceiling	1		Freedom from odors	2	
Proper stall, tie, and manger	1		Cleanliness of bedding	1	.....
Provision for light: Four square feet of glass per cow	4	.....	Barnyard	2	.....
(Three square feet, 3; 2 square feet, 2; 1 square foot, 1. Deduct for uneven distribution.)			Clean	1	
Bedding	1	.....	Well drained	1	
Ventilation	7	.....	Removal of manure daily to 50 feet from stable	2	.....
Provision for fresh air, controllable flue system	3		MILK ROOM OR MILK HOUSE.		
(Windows hinged at bottom, 1.5; sliding windows, 1; other openings, 0.5).			Cleanliness of milk room	3	.....
Cubic feet of space per cow, 500 feet	3		UTENSILS AND MILKING		
(Less than 500 feet, 2; less than 400 feet, 1; less than 300 feet, 0.)			Care and cleanliness of utensils	8	.....
Provision for controlling temperature	1		Thoroughly washed	2	
UTENSILS.			Sterilized in steam for 15 minutes	3	
Construction and condition of utensils	1	.....	(Placed over steam jet, or scalded with boiling water, 2.)		
Water for cleaning	1	.....	Protected from contamination	3	
(Clean, convenient, and abundant.)			Cleanliness of milking	9	.....
Small-top milking pail	5	.....	Clean, dry hands	3	
Milk cooler	1	.....	Udders washed and wiped	6	
Clean milking suits	1	.....	(Udders cleaned with moist cloth, 4; cleaned with dry cloth or brush at least 15 minutes before milking, 1.)		
MILK ROOM OR MILK HOUSE.			HANDLING THE MILK.		
Location: Free from contaminating surroundings	1	.....	Cleanliness of attendants in milk room	2	.....
Construction of milk room	2	.....	Milk removed immediately from stable without pouring from pail	2	.....
Floor, walls, and ceilings	1		Cooled immediately after milking each cow	2	.....
Light, ventilation, screens	1		Cooled below 50° F	5	.....
Separate rooms for washing utensils and handling milk	1	.....	(51° to 55°, 4; 56° to 60°, 2.)		
Facilities for steam	1	.....	Stored below 50° F	3	.....
(Hot water, 0.5.)			(51° to 55°, 2; 56° to 60°, 1.)		
			Transportation below 50° F	2	.....
			(51° to 55°, 1.5; 56° to 60°, 1.)		
			(If delivered twice a day, allow perfect score for storage and transportation.)		
Total	40	.....	Total	60	.....

Equipment..... Methods..... Final score.....

Note 1.—If any exceptionally filthy condition is found, particularly dirty utensils, the total score may be further limited.

Note 2.—If the water is exposed to dangerous contamination, or there is evidence of the presence of a dangerous disease in animals or attendants, the score shall be 0.

The instructor may obtain sample sheets of this record by applying to the Dairy Division, Bureau of Animal Industry, U. S. Department of Agriculture.

SCORE CARD FOR DAIRY COWS.

(Dairy Division, Bureau of Animal Industry, U. S. Department of Agriculture.)

Points.		Perfect score.	Percentage value.	Student's score.	Instructor's score.
1. General form		9			
Wedge shaped, when viewed from side, top, and front	6				
Size for the breed—Jersey, 800 pounds; Guernsey, 1,050 pounds; Ayrshire, 1,000 pounds; Holstein, 1,200 pounds	3				
2. Quality		7			
Hide—thin, mellow, pliable, and loose	2				
Hair—fine, soft	1				
Secretions—abundant, yellowish	1				
Flesh—muscular, free from bunchiness	1				
Veins—large and prominent	1				
Bone—fine and clean	1				
3. Head		6			
Forehead—broad between the eyes and dished according to breed	1.0				
Face—medium in length, clean cut in outline, dished below eyes	.5				
Nostrils large	1.0				
Muzzle—broad, but not coarse	1.0				
Jaws—wide at base, strong	.5				
Ears—medium sized, thin, hair fine, blood vessels showing, secretion abundant	.5				
Eyes—full, prominent, clear, and bright	1.0				
Horns—small at base, incurving, attached close together at poll	.5				
4. Neck		2			
Moderately thin, of good length, nearly free from loose skin, neatly joined, throat clean.					
5. Forequarters		11			
Shoulders—withers sharp; shoulder blades lean	2				
Chest—broad and deep, well-sprung fore-ribs; large heart girth; moderately full crops; brisket light	8				
Forelegs—straight, fine bone, strong	1				
6. Body—capacity		18			
Back—straight, strong, vertebræ prominent	5				
Ribs—long, flat, well sprung, wide apart	3				
Abdomen (barrel)—long, deep, broad, well held up; loin broad, strong, and level; flanks low	10				
7. Hindquarters		12			
Hips—wide apart, prominent	3				
Rump—long, wide, level	3				
Pin bones—widely spaced, on level with hips	3				
Thighs—incurving; escutcheon broad, extending well up on pin bones	1				
Tail—tapering, fine boned, long and neatly set on; switch, long	1				
Hind legs—squarely placed not sickle-hocked, bone fine	1				
8. Mammary system		35			
Udder—large; quarters even and not cut up between; extending well up behind and well forward in front; not fleshy; soft and pliable	20				
Teats—squarely placed; even in size; of convenient size for milking; free from lumps, not leaky or hard to milk	8				
8. Mammary veins and wells—veins long, branching, tortuous, entering body well forward; wells large	7				
Total		100			

Indicate score on the following basis: 1.0, perfect; 0.9, very slight defect; 0.8, slight defect; 0.7, defective; 0.6, marked defect; and 0.5, poor.

The number of points given for any particular part of the animal should be multiplied by the per cent given that part by the student. For example, an animal with defective wedges is given a rating of 0.7, which, multiplied by 6, the point allowed for perfect score, gives 4.2 as the final score for wedge-shaped.

BUTTER SCORE CARD.

	Scale.	Score.	Remarks.
Flavor	45		
Texture	25		
Color	15		
Salt	10		
Package	5		
Total	100		

SUGGESTIONS ON HOW TO MAKE A SIMPLE CHART TO REPRESENT THE COMPOSITION OF MILK.

Fourteen ounces water in a pint bottle.
One-half ounce melted butter in ½ ounce vial.
One-half ounce cheese (protein) in ½ ounce vial.
Seven-eighths ounce milk sugar in 1 ounce vial.
One-eighth ounce salt (mineral matter) in smallest vial.
Label neatly and mount on cardboard.

DAIRY BREEDERS' ASSOCIATIONS.

Letters addressed to the secretaries of these associations will bring interesting material for the use of the teacher.

American Guernsey Cattle Club. Wm. H. Caldwell, secretary, Peterboro, N. H.

American Jersey Cattle Club. R. M. Gow, secretary, 324 West Twenty-third Street, New York, N. Y.

Ayrshire Breeders' Association. C. M. Winslow, secretary, Brandon, Vt.

Brown Swiss Cattle Breeders' Association. Ira Inman, secretary, Beloit, Wis.

Holstein-Friesian Association of America. Frederick L. Houghton, secretary, Brattleboro, Vt.

PUBLICATIONS OF THE UNITED STATES DEPARTMENT OF AGRICULTURE RELATING TO DAIRYING.

FARMERS' BULLETINS AVAILABLE FOR FREE DISTRIBUTION.

363. Use of Milk as Food.
413. Care of Milk and Its Use in the Home.
487. Cheese: Economical Uses in the Diet.
578. Making and Feeding of Silage.
602. Clean Milk: Production and Handling.
623. Ice Houses and the Use of Ice on the Dairy Farm.
689. Plan for a Small Dairy House.
717. Food for Young Children.
743. The Feeding of Dairy Cows.
748. A Simple Steam Sterilizer for Farm Dairy Utensils.
777. Feeding and Management of Dairy Calves and Young Dairy Stock.
824. How to Select Foods. III. Foods Rich in Protein.
825. Pit Silos.
850. How to Make Cottage Cheese on the Farm.
876. Making Butter on the Farm.
893. Breeds of Dairy Cattle.
927. Farm Home Conveniences.
930. Marketing Butter and Cheese by Parcel Post.
976. Cooling Milk and Cream on the Farm.
993. Cooperative Bull Associations.
1019. Straining Milk.

OTHER DEPARTMENT PUBLICATIONS AVAILABLE FOR FREE DISTRIBUTION.

Office of Secretary Circular 109, Cottage Cheese Dishes.

Department Bulletin 744, Cooling Milk and Storing and Shipping It at Low Temperature.

Department Circular 26, Delicious Products of the Dairy.

Bureau of Animal Industry Circular 195, A Plan for a Small Dairy House.

Bureau of Animal Industry Circular 204, Officials, Organizations, and Educational Institutions Connected with the Dairy Interests.

Bureau of Animal Industry Document A–12, Chemical Testing of Milk and Cream.

FOR SALE BY SUPERINTENDENT OF DOCUMENTS, GOVERNMENT PRINTING OFFICE, WASHINGTON, D. C.

Farmers' Bulletin 337, Cropping Systems of New England Dairy Farms. Price, 5 cents.

Farmers' Bulletin 349, Dairy Industry in the South. Price, 5 cents.

Farmers' Bulletin 490, Bacteria in Milk. Price, 5 cents.

Farmers' Bulletin 589, Homemade Silos. Price, 5 cents.

Department Bulletin 177, The Production and Consumption of Dairy Products. Price, 5 cents.

Department Bulletin 319, Fermented Milk. Price, 5 cents.

Department Bulletin 356, Milk and Cream Contests. Price, 5 cents.

Department Bulletin 434, Judging the Dairy Cow as a Subject of Instruction in Secondary Schools. Price, 5 cents.

Department Bulletin 642, The Four Essential Factors in the Production of Milk of Low Bacterial Content. Price, 15 cents.

Bureau of Animal Industry Circular 197, Directions for Home Pasteurization of Milk. Price, 5 cents.

Bureau of Animal Industry Circular 218, Legal Standards for Dairy Products. Price, 5 cents.

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